RoboLabs
Incredible machines for fastfood & funfood

OPERATING MANUAL

ROBOPOP® 60 (VPM-RM4)

CAUTION: READ THE INSTRUCTIONS BEFORE USING THE MACHINE!

PDF version of this manual is available on www.robolabs.pro

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Safety requirements


DO NOT WASH MACHINE WITH WATER!


ONLY INSTRUCTED PERSONNEL ARE ALLOWED TO OPERATE THE MACHINE!


IT IS PROHIBITED TO USE MACHINE FOR PROCESSING OTHER KERNELS THAN CORN!


DO NOT LEAVE RUNNING MACHINE UNATTENDED!


ALL SWIVEL CASTERS MUST BE LOCKED WHILE IN OPERATION!


BEWARE MOVING PARTS!


SOME PARTS ARE HOT WHILE IN OPERATION!
BURN HAZARD!

1. Overview

1.1. Purpose

Vortex Popcorn machine VPM-RM4 (Robopop® 60) (hereinafter “popper” or “machine”) is a hot-air popper for making popcorn. Both Butterfly and Mushroom varieties can be processed. Built-in automatic salt/oil application system allows making salted movie-style popcorn. Popper built on patented Vortex technology that has following benefits:

- No oil is used at all. Hot-air popped popcorn has no carcinogens and trans-fats; moreover, production cost is lower.
- Maximum taste and nutritional value are preserved, since popcorn doesn’t spend more time than necessary in hot chamber.

1.2. Technical Specifications

Throughput[1]	up to 28 kg/h
Ampacity	25 A
Rated voltage	3/N/PE AC 230/400 V 50/60 Hz
Rated power	11,3 kW
Machine dimensions (LxWxH)	1430x600x1700 mm
Shipping dimensions (LxWxH)	1800x1530x800 mm
Net weight	250 kg
Shipping weight	400 kg
Ingress protection	IP22

1.3. Delivery Set

Popper	1 pc
Cleaning scraper	1 pc
Cleaning brush	1 pc
Popcorn cart	2 pc
LDPE bags	50 pcs
Spare halogen light bulb	1 pc
2 L cup	1 pc
Documentation	1 set

[1] Weight of raw corn processed. Actual production capacity of ready-to-eat product depends on corn quality and settings. Weight loss caused by natural reasons during the process may be up to 20%.

1.4. Power Requirements

CONNECTIONS MUST BE DONE ONLY BY QUALIFIED ELECTRICIAN!

ELECTRIC SOCKET MUST HAVE GROUNDING TERMINAL!

IF SUPPLY CORD DAMAGED, IT MUST BE REPLACED BY MANUFACTURER, SERVICE AGENT, OR QUALIFIED PERSONS IN ORDER TO AVOID HAZARD!

It is necessary to periodically check electric connections, including grounding connection. Whenever any fault conditions are found, do not turn the equipment and call for qualified electrician!

Equipotential bonding wire (up to 10 sq.mm) shall be connected to screw terminal marked with IEC 5021 sign. ⏚

Cable plug is not included in the delivery set. Use a 32 A plug. Refer to the wiring diagram on the power cord label.

It is necessary to check electric wires and ground connection of the machine periodically. In case of faults found, an electrician must be called. It is allowed to turn the machine on only after all the issues are resolved.

1.5. Ambient Conditions

The equipment must be operated at the ambient temperature between +5° and +40°C (+41°F to +104°F), relative humidity not more than 45% at 40°C/104°F). Altitude above sea level should not exceed 1000 m.

While in operation, a lot of moisture and heat is coming out of the popper. It is essential to provide exhausting hood (800x800 mm, 750 cu.m/hr or more) installed above popper's output port.

Ambient conditions have strong effect on the end product quality! See section 2.7 for more details!

1.6. Safety Components

EMERGENCY STOP button located on the back side of the machine should be used in case of emergency, pressing the button turns machine off immediately.

USING EMERGENCY STOP BUTTON MAY LEAD TO CHAMBER CLOGGING!

32 A circuit breaker protects the machine from short circuit.

Voltage control relay analyzes voltage at the machine’s input. Tolerance gap is preset on the unit. If the voltage value is beyond the gap, popper won’t be energized.

Safety temperature sensor is located close to heating elements. In case of overheating, safety temperature regulator will turn off the contactor that runs heating elements, so they will be de-energized and temperature won’t rise further.

The main PLC controls actual turbine rotation speed in the beginning of operation. If the speed is below 40 Hz for more than 30 sec, then operation will be stopped and an error message will appear on the screen.

Popper has four swivel lockable casters, which avoid spontaneous movements.

1.7. Main Components

Main components are: 1 – Turbine (not shown); 2 – Chamber; 3 – Corn Hoppers; 4 – Controls; 5 – Salt Hopper; 6 – Sifter; 7 – Scrap Tray; 8 – Oil Pump; 9 – Oil cabinet; 10 – Popcorn Cart, see Fig.1:

Fig. 1 Main components

Turbine (Blower)

The turbine provides constantly circulating airflow inside the popper. This is a direct type drive; the blower sits on motor's shaft. Rotational speed is controlled by the main PLC.

Chamber

This is where popping happens. Airflow circulates through the chamber; air is being heated by heating elements. In the chamber's lower part there is a bowl with special shaped holes that causes air vortex.

During machine operation corn kernels are being fed into the chamber; kernels are being heated up, and finally, immediately blown away from the chamber once popped.

Chamber can be easily accessed through the door provided. Halogen lamp illuminates chamber inside, helping operator to control the operation.

Chamber is equipped with temperature sensor and optical sensor.

Chamber optical sensor

The chamber optical sensor monitors processes happening in the chamber. Popper uses signal from this sensor in order to maintain smooth and effective operation process.

Chamber temperature sensor

Chamber temperature sensor helps to maintain the temperature in the chamber.

Corn sensor

Each corn hopper has corn sensor that controls amount of corn left in the hopper. Sensor trips whenever few kg of corn are left in hopper; alert message will appear on the screen.

Sifter and scrap tray

Sifter is a rotating drum that screens un-popped kernels (“old maids”), partly popped popcorn, and other small fractions into scrap tray located under the sifter. Scrap tray is easily removable.

Controls

There are following controls on the front panel:

START push button. Turns machine on.

SIFTER push button. Operates sifter.

OIL WARMER switch. Turns oil warmer on.

HMI panel. Two-way communication between machine and operator.

Salt feeder

Salt applicator includes following parts: salt hopper with cover, feeding auger, blowing fan, and removable salt application tube.

Oil compartment and oil pump

Oil compartment has enough room to accommodate two oil canisters, 22 kg

each. Draw-out tray makes canister replacing easier. Heating elements below compartment are provided.

Popcorn cart

Two movable carts and 200 liter bags (LDPE) are included in the delivery set. Using two carts makes easier changing full bag for an empty one. The machine is equipped with cart sensor tripping whenever cart is full and needed to be replaced.

Cart sensor

The sensor trips when plastic bag in cart is full with popcorn. Once sensor is triggered, warning message appears on the screen and audible alarm will be given. If no action is taken, the machine will stop popping process and will be switched to the pause mode.

1.8. Getting Started

2. Carefully unpack the machine, check delivery set and remove protective film from all surfaces.
3. Once machine in dedicated position, lock all four swivel casters.
4. Plug machine into the mains (see section 1.4).
5. Assemble both carts provided in the delivery set.
6. Turn the machine on by pressing START button.

Check sifter operation. Press SIFTER RUN&STOP button and hold it for a while. Sifter should rotate then. If it does not rotate evenly and extraneous sound is heard, it means that sifter isn’t aligned on the rollers. To align the sifter, lift it with hands and place on the rollers.

2. Intended Use

2.1. Operation Modes

The popper has following operation modes:

- Heating mode. Once desired program button is pressed, popper automatically starts to heat up. Upon reaching certain temperature popper switches automatically to popping mode.
- Popping mode. This is the main operation mode.
- Pause mode. Popper doesn’t process corn in this mode, but maintains temperature in the chamber; thus, popping process can be resumed in no time.
- Cooling mode. Before turning off, popper must be cooled down. In cooling mode heating elements are completely de-energized; turbine keeps running, cooling down the machine. Once temperature drops low enough, popper is turned off automatically.
- Testing mode. This mode is used for testing popper components. See Annex D for more details.

2.2. Quick Operation Guide

DO NOT LEAVE MACHINE UNATTENDED!

ALWAYS FILL CORN HOPPER TO THE TOP!

Make sure that scrap tray is empty and chamber is clean and not clogged.

Put empty plastic bag into popcorn cart and put the cart under the sifter.

Put raw corn in corn hoppers, salt in salt hopper, and liquid oil in oil compartment. Turn the machine on. Start screen will appear:

Fig. 2 Start screen

Press Butterfly or Mushroom program button. Program settings screen will appear:

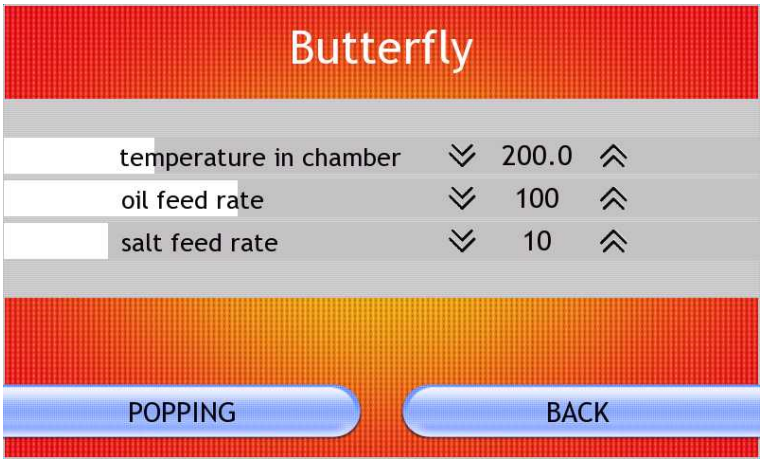


Fig. 3 Program settings screen

If nothing is pressed, heating stage will start in 10 seconds automatically. Heating will take 15-20 minutes, depending on ambient conditions and settings. Once heating is completed, machine will be switched in popping mode automatically. Popping mode screen will appear:

Fig. 4 Popping mode screen

Cart/Bag replacing

There are two carts for plastic bags included in the delivery set. Make sure that you put plastic bag into each cart prior to use. Each cart is equipped with swivel casters; it is convenient to keep empty cart close to full cart and once first cart is full, then swiftly shift them.

Also, it is possible to give a short break to the sifter in order to replace cart or bag. Press and hold SIFTER RUN&STOP button for 1 sec. Sifter will stop in smooth manner. After 10 seconds its operation will be resumed automatically.

DO NOT USE PAUSE BUTTON FOR CHANGING THE CART!

Program settings adjustment

Program settings can be adjusted either before warming up stage or during popping stage. During popping stage, press and hold sprocket icon button in the upper right corner of the screen (see Fig.5). Parameters screen will appear. To adjust parameters, press MODIFY button, enter password (‘2325’ by default), and press ENTER. Use up and down arrow buttons to adjust parameters. Press BACK for return; if not pressed, the settings will be saved and machine returns back to popping mode screen automatically shortly.

Refilling ingredients

If less than 5 kg (approx.) of corn left in a hopper, ‘Load corn in left (right) hopper’ message will appear on the screen. If more popcorn needs to be processed, top up the hopper. Otherwise, ignore the message, and machine will process the corn amount left. See “Corn Sensor Delay” setting in section 2.3.

There are no sensors for oil and salt. Refill oil and salt as necessary.

Pause mode

The purpose of pause mode is to stop popcorn production for a while, or to switch between Butterfly and Mushroom programs. During the pause mode oil/salt operation is suspended; the temperature in chamber is kept on the set value.

DO NOT USE PAUSE BUTTON FOR CHANGING THE CART!

Program change

To switch the program, press PAUSE button. Corn supply will stop immediately. It will take 3 minutes to finish processing of corn kernels in the chamber. After this, two program buttons, Butterfly and Mushroom, will appear on the screen.

Cooling down

To stop the operation, TURN OFF button should be pressed. Corn feeding will be stopped immediately. Corn in the chamber will be processed. If Butterfly program was chosen, oil and salt application will be active for some time.

Cooling takes some time, after a while the main screen appears.

Turning off

To turn the machine off, press and hold TURN OFF button. Also, machine will be turned off automatically after 10 minutes if nothing pressed.

Chamber clogging

If you see “Chamber is clogged with popcorn” message then do the following.

DO NOT OPEN CHAMBER DOOR UNTIL MACHINE IS COOLED DOWN. DO NOT USE FIRE EXTINGUISHERS!

1. DO NOT panic and DO NOT use fire extinguishers!

2. Patiently wait for machine cooling down.

3. Once turbine is stopped, turn the machine off. To do this, press and hold TURN OFF button.

4. Machine is still hot. Wait few hours to let machine cool down completely.

5. Take out the door and clean up the chamber. Pay attention to chamber inner hollows as well as to corn delivery tube, which may be clogged with popped and unpopped popcorn. Use a suitable tool (piece of cable, or probe or hose), which is flexible and strong enough for shattering the clog inside the tube.

6. Once chamber is clean close the door and turn the machine on. Release OVER.LOCK indicator. See section 2.4.

CHAMBER CLOGGING CAUSED BY ACTIONS OF UNEXPERIENCED USERS OR IMPROPERLY CHOSEN PARAMETERS IS NOT A WARRANTY CASE!

2.3. Program settings

Machine settings directly affect popcorn quality as well as machine operation. It is important to understand the way each parameter or setting affects end product and machine operation; and also the way how settings interact to each other.

There are two settings groups: program settings and system settings.

Popping temperature

Popping temperature is to be chosen by user. During operation, the machine maintains the chamber temperature at this value. Due to different features of used corn and chosen settings, and also nature of complex processes happening in the chamber, slight temperature fluctuation is allowed (±5°C).

Popping temperature affects the way how popcorn pops; its shape and size. Too high values lead to smaller popcorn. Too low values lead to reduced productivity, improperly popped kernels, and chamber clogging.

Common popping temperature for Butterfly is between 200 and 215°C; for Mushroom between 210 and 225°C.

Due to constructive features, it takes few minutes to see the result once the temperature has been changed. Current chamber temperature can be found in the upper left corner of the popping screen.

Oil and salt feed rate

Oil and salt are only available in Butterfly program only. Oil and salt feed rate values directly affect amount of oil/salt to be supplied to the product for the same time.

2.4. System settings

System settings can be accessed from the start screen or from popping screen. Press SETTINGS, enter password ‘6666’, and confirm with ENTER. System settings screen will appear:

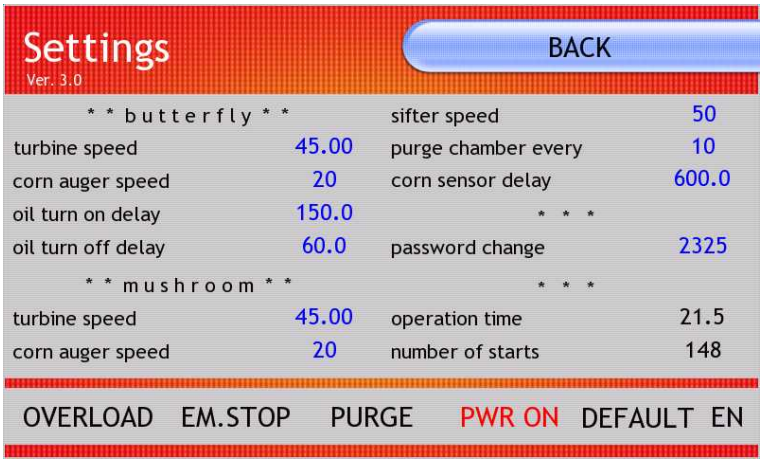


Fig. 5 System settings screen

All values in blue are available for adjustment. Press any of them, type new value and confirm with ENTER. Values in black are for reference only and cannot be changed.

Turbine speed

Turbine speed defines airflow intensity in the chamber. Due to popcorn shape, turbine speed for Mushroom is normally higher than the same for Butterfly.

As like the popping temperature, extreme values of turbine speed may cause a bunch of issues. Too low values lead to popcorn accumulation in the chamber, and finally clogging. Too high values increase scrap rate.

Airflow intensity can be reduced because of clogged mesh screen inside the chamber. Keep the chamber clean, see section 3.1.

Corn auger speed

Corn auger rate setting defines actual throughput rate (amount of raw corn processed per hour). The faster auger rotates the more corn kernels processed for the same time. If low quality corn is used, then corn auger rate should be decreased, to avoid chamber clogging. If high quality corn is used, then auger rate may be increased. Keep this setting at low value to make machine's behavior more stable and tolerant to low quality corn, improperly chosen parameters and unexperienced operators.

Oil turn on delay

Defines how soon oil and salt applicators will be turned on after the machine turned in popping mode (corn started to be supplied into the chamber).

Oil turn off delay

Time delay oil and salt applicators operates once machine is turned in pausing or cooling mode.

Sifter speed

Sifter speed setting defines how fast sifter rotates. Too slow sifter may cause chamber clogging; too fast sifter may affect proper scrap screening process and application of oil and salt.

Purge chamber every

Defines operation cycle of automatic purge feature, see below.

Corn sensor delay

This one sets timer, which is activated once corn sensor tripped; upon timer expiring operator hears audible alarm.

Password change

Password required for program parameters adjustment. The main purpose is to avoid program parameters to be changed by unauthorized personnel.

2.5. Operation indicators

In the lower part of the settings screen there are some indicators presented[2]:

OVERLOAD (OVER.LOCK) — chamber sensor operation indicator. Becomes red once tripped.

MUST be released in order to continue operation! Press and hold until it turns black!

EM.STOP (EM.LOCK) — becomes red once machine has been turned off with emergency stop button[3].

MUST be released in order to continue operation! Press and hold until it turns black!

PURGE ON/OFF (PURGE ON) — automatic chamber purge option. While activated, machine periodically increases turbine speed on a time basis defined by “Chamber Cleaning Every” parameter (see above). It helps to evacuate scrap from the chamber, avoiding clogging.

PWR (PWR ON) — economy mode switch. While activated, power consumption is decreased and machine draws not more than 30 Amps.

CAUTION! Using this mode may affect productivity and/or product quality in negative way!

DEFAULT Press and hold to reset all settings to default.

EN (RU) Press to change interface language.

While machine in popping mode most system settings can be adjusted, except (no access to operation indicators though). Press and hold sprocket icon button in the upper right corner of the popping screen (see Fig.5). Parameters screen will appear. Press MODIFY button, enter password ‘6666’, and press ENTER.

[2] Some settings are not available during operation mode.

[3] Upon certain temperature conditions.

2.6. Display notifications

During normal machine operation different notifications may be displayed on the screen. Below is the list and operator's actions suggested to be taken.

Heating / Popping / Pause / Cooling

Indicates current operation mode.

Load corn in left (right) hopper

Corn sensor has been tripped. Refill the hopper or let the machine to process kernels left. See also "Corn Sensor Delay" setting.

Change bag with popcorn

Bag sensor is tripped. Replace the full cart. Failing to do so will lead to sound alarm activation and machine will automatically go in pause mode shortly.

Oil and salt will start automatically

While Butterfly program in operation, this message will appear once corn kernels started to be supplied in the chamber. This is just a reminder that oil and salt supply will start in certain time. See "Oil Turn On Delay" setting.

Chamber is clogged with popcorn

Machine chamber is equipped with chamber clogging sensor that watches what is happening in the chamber. Based on the sensor's output, machine can increase turbine spinning rate automatically in order to blow out excessive stuff out of the chamber. If it is not sufficient, then sensor trips and machine switches into cooling mode, and said message can be seen on the screen.

Chamber clogging sensor trips not only in case of actual clogging, but also in case if too small amount of corn was put in the hopper or corn sensors have been blinded (for purpose or incidentally). To continue operation, related indicator should be released. See "Overload" indicator in section 2.4.

Automatic machine disconnection

Machine has been forcedly switched into cooling mode. Use an observation port

on the chamber’s door to make sure that the chamber is really clogged. Wait patiently while machine is cooled down. Do not open the chamber, do not use fire extinguisher! Once the machine is cooled down, clean the chamber. See section 3.1.

Also this message can be seen upon turning the machine on. To continue operation, related indicator should be released. See section 2.4.

Motor turbine failure

If the turbine speed is below 40 Hz for more than 30 sec in the beginning of heating stage the said message will appear.

Temperature sensor failure

The temperature value coming from the temperature sensor is more than 350°C.

2.7. Popcorn quality

Popcorn is a very sensitive product that requires ultimate attention towards many aspects. Understanding popcorn processing technology is the key to good quality production.

Raw corn

It is impossible to get good stable result using low quality supplies, first of all, raw corn kernels. Choose reputable and reliable corn suppliers. Make sure that raw corn is stored and handled properly at your production site. Ask your corn suppliers for recommendations on storage and handling recommendations.

Popcorn crunchiness

Popcorn is crunchy when its moisture content doesn't exceed 1-1.5%. Popcorn that just came out of the machine may have moisture content circa 4-5% as it is still losing moisture as cooling down. It is recommended to establish proper environment and workflow at the site to be able to achieve top quality product.

Production capacity

Unlike traditional kettle poppers, Robopop has continuous operation workflow. Corn is being fed into the chamber continuously; constant product flow is established. To provide smooth temperature regulation, corn auger rotates slower in the beginning of popping stage and gradually increases its speed until set value is reached.

For this reason, it is strictly necessary to have long operation sessions rather than short ones. This is essential for high quality of the end product and high production capacity as well as for stable machine operation.

Using oil and salt

Most kinds of liquid oil without any added powder may be used.

IMPORTANT NOTE ON USING OIL!

Oil pumping rate depends on oil thickness; it is very important to avoid oil temperature fluctuations to keep pumping rate the same.

To be sure that oil is kept at the same temperature following conditions must be met:

1. OIL WARM switch must be at ON position all the time, even at night[4].
2. Oil compartment doors must be kept closed all the time.
3. Two oil canisters must be always kept in the compartment; empty canister must be replaced in time.

The machine is intended for using with special salt only. Using common salt or powders of other kind (e.g. cheese or sugar) may lead to salt applicator clogging and equipment failure.

While colored oil is used, freshly made popcorn with oil and salt may have patchy look and oily feeling. While being processed further, oil will be spread across popcorn in even manner, and soaked into popcorn.

[4] If machine is not operated (at least in Butterfly mode) for a long time, oil warmer may be turned off.

3. Technical maintenance

3.1. Cleaning guide

The purpose of technical maintenance is to keep the machine operable during the entire service life. The recommended cleaning schedule is presented below[5]:

PROCEDURE	PERIOD
Outer surfaces cleaning	Once a day
Sifter cleaning	Once a day
Oil nozzle cleaning	Once a day
Salt tube cleaning	Once a day
Chamber cleaning	Once a day
Sifter rollers cleaning	Once a month
Corn supply tube cleaning	Once a month

DISCONNECT ELECTRIC PLUG BEFORE CLEANING!

DO NOT WASH MACHINE WITH WATER!

DO NOT USE SHARP TOOLS OR ABRASIVES FOR CLEANING!

WAIT UNTIL MACHINE IS COOLED DOWN BEFORE CLEANING!

Outer surface cleaning

Clean outer surfaces of the machine by the means of dry and clean cloth; it is allowed to use a cloth slightly damped with soap water. It is convenient to clean the sifter by a scraper included in the delivery set. To rotate the sifter, press and hold SIFTER button on the front panel.

Sifter cleaning

Sifter is not rigidly connected to the machine and can be taken out of the machine. Sifter lies freely on two shafts each with couple of rubber rollers. In the course of time, the rollers' surface may become greasy and slippery, because of natural corn oil and dust. This may cause sifter stop and chamber clogging. To avoid this, rollers must be cleaned as necessary. It is suitable to do with a hard

[5] Period may be different. Cleaning must be done as often as required.

steel brush or other tool that provides strong impact on grease layer on rollers' surface.

Oil nozzle cleaning

Use a damp cloth with mild detergent to wipe oil nozzle.

Salt tube cleaning

Remove salt tube and wash it with warm water. Dry it completely before taking back on the machine. Failed to dry may lead to tube clogging!

Chamber cleaning

It is necessary to clean the chamber of husk and dust once a day. To clean the chamber, unfasten the latches which hold the hatch, and pull it out. After that, remove husk and debris from the chamber. It is handy to use a vacuum cleaner for this operation.

After cleaning, place the hatch back and fasten up the latches.

During long time operation, certain amount of corn dust is accumulated in the chamber. It is important to clean mesh screen.

Open the chamber. There is a baffler in the center. The mesh screen is behind the baffler. Normally there is enough room to get access to the screen in order to clean it. However, if required, baffler can be removed. To do so, remove two bolts that fix the baffler to sidewalls. Then pull the baffler out. Once mesh screen is cleaned, put the baffler back and fix it with the bolts.

Make sure that chamber sensor head (little red dot next to temperature sensor) overtops the chamber wall, and its surface is free of dust. Clean it gently with soft dry cloth if required.

Corn dispensing tube cleaning

Corn supply tube may be cleaned with a cleaning brush included in the delivery set. Operate the brush from the side of loading funnel and from the side of chamber.

3.2. Light bulb replacement

To replace light bulb do the following.

1. Turn off the machine and disconnect it from the mains. Wait until the machine cools down.

2. Unfasten four latches (1) that holds the door (2). Take the door by plastic handles and pull it out.

3. Light bulb is located in the upper part of the chamber.

4. Remove four bolts (4) that hold protective glass (3).

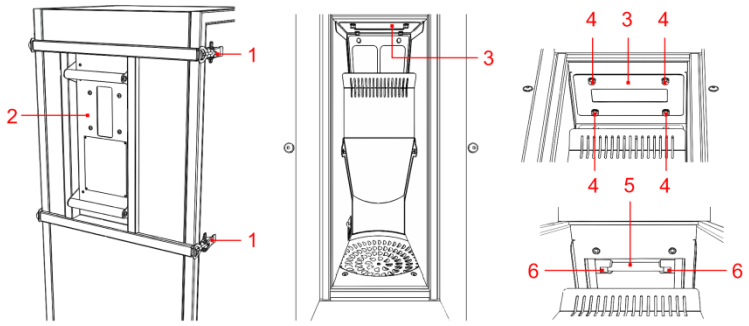


Fig. 6 Light bulb replacing

5. To demount the lightbulb (5), shift it a bit aside (right or left). Spring-loaded lamp socket (6) needs to be squeezed a bit to take off the bulb.

THE BULB MIGHT BE HOT! BURN HAZARD!

6. Spare lamp is included in the delivery set. To replace the lamp, take the spare one from the box, but do not extract from the plastic wrap.

Do not touch the new lightbulb with bare fingers; skin fat can cause bulb destruction during further operation! If the bulb is greasy, wipe it thoroughly with soft, clean and dry cloth before putting it in.

7. Take the bulb using the same cloth, and insert one end in the socket (6). Squeeze the socket a bit and insert the other end of the bulb.

8. Set protective glass (3) back and fix it with four bolts (4). Then put the door (2) back and fasten the latches.

3.3. Preservation

If the machine is not operated for a long time, it is necessary to perform all cleaning procedures listed above.

4. Troubleshooting

Problem	Possible cause	Possible remedy
Chamber clogged with popcorn often	- low quality corn - corn storage conditions are not met - wrong chosen settings of the machine - chamber clogging sensor is detuned - incorrect setting of corn hopper sensor	- use high quality corn - provide proper storage conditions for raw corn - adjust popping temperature - adjust turbine speed - adjust corn auger speed - set up chamber clogging sensor operation distance properly, see the Annex below - adjust hopper sensor, see the Annex below
Too much scrap	- low quality corn - too high turbine speed - short operation sessions	- use high quality corn - decrease turbine speed - avoid too frequent pausing and switching between programs
Popcorn is not crispy	- low quality corn - extreme ambient conditions - no exhausting hood provided - popcorn is still hot	- use high quality corn - provide proper ambient conditions - provide exhausting hood - arrange the workflow such a way to let popcorn to cool down - use a special tool to check moisture content of the product - note that generally Mushroom is less crispy than Butterfly
Oil supply is not stable	- machine operated by short (10-15 min) sessions, which is not enough for reaching stable operation mode - oil temperature is not constant	- make sure the machine operates for longer periods without interruption, avoid frequently activating pause mode and/or to switch between programs frequently - keep oil compartment closed all the time - keep oil heater on all the time, including night time - replace empty oil containers in time - aim to keep room temperature as stable as possible all the time
Salt supply is not stable	- common salt used - excessive ambient conditions in the production room - no exhausting hood provided - improper and/or irregular maintenance	- use special salt only - provide proper ambient conditions - provide exhausting hood - perform maintenance as required
Oil/salt start to be supplied too early or too late	- improper delay parameter	- set delay parameter properly
Popcorn with oil and salt has patchy look	- oil with colourant added is used - not enough time for oil to be soaked into popcorn and spread over it	- use oil with no colorant added - let popcorn rest for a while, oil will be soaked into and spread over popcorn
Too small popcorn	- too high popping temperature	- reduce popping temperature
Too much butterfly shaped popcorn while	- too low popping temperature	- increase popping temperature

making Mushroom		
Corn is not being pushed into the chamber while machine is in popping mode	- connection fault between corn auger motor, stepper driver, and the main PLC - mechanical jam in auger	- check connections between corn auger motor, stepper driver, and the main PLC unit - manually check the rotation of auger (the machine must be turned off)

5. Transportation and storage

The equipment may be transported by any kind of covered vehicle, in accordance with transportation rules for this kind of vehicle.

Ambient temperature during the transportation and storage must be between minus 25°C and +55°C (-13°F to 131°F).

6. Acceptance certificate

ACCEPTANCE CERTIFICATE

_____ _____

Product Name Serial No.

The equipment is made with accordance to mandatory requirements of the state standards, actual technical documentation, and approved for use.

QC Engineer

STAMP HERE

_____ _____

Signature Full Name

_____

DD.MM.YYYY

7. Warranty obligations

The manufacturer guarantees trouble-free operation of the equipment during 12 months from the date of receiving the equipment by dealer (in accordance with transport documentation); or, in case of purchase directly through Trapeza LLC, from the purchase date, given that terms of using, transportation, and storage are met.

The warranty repair is performed upon presentation of this manual and filled warranty card with the seller’s seal and the date of sale.

Technical specifications of the equipment can be changed by manufacturer at any time due to improvements and/or other reasons. Technical specifications stated in this document are intended to act as a reference point, which is necessary to evaluate suitability of the equipment for the customer’s needs, and are not the subject of warranty policy.

The information stated in this document has been thoroughly checked and considered as accurate one; nevertheless, the manufacturer is not responsible for any typographical errors or misprints.

Due to constant improvement of the equipment, technical specifications are subject to change without prior notice!

8. Manufacturer details

NPO Tvertorgmash LLC

11 Industrial Street, Tver, 170000 Russia

Technical support:

Email: support@robolabs.pro

Phone: +7 495 956 4000

Annex A. Electric component list

INDEX	DESIGNATION	MODEL	SPECS
AT1, AT2	Limiting thermostat	TK24-00-1-90	230 V, 16A
BL1 — BL3	Photoelectric sensor	E3F1-DP12	24 V
BL4	Digital fiber amplifier with sensor head	E3X-NA41 2M E32-D61	24 V
BT1	Temperature sensor	ДТПК 054-00.120/2	K type
BT2	Temperature sensor	ДТПК 124-00.32/2,5	K type
BZ	Buzzer	SC235B	24 V
DC1	Programmable logic controller	DVP12SA211T	230 V
DC2	PLC extension output	DVP08SN11T	24 V
DC3	Temperature module	DTC1000V	24 V
DC4	Limiting temperature regulator	TC4SP	230 V
DD1 — DD5	Digital stepping driver	DM556	24 V
EK1 — EK4	Heating element	1GIK8BL33001 IRCA	230 V, 2500 W
EK5, EK6	W-type heat element	1GIK1Z159001 IRCA	230 V, 600 W
EL	Halogen lamp	64684 ECO	230 V, 48 W
EMI	3-phase EMI filter	DL-25EA3	400 V, 25 A
HL	Contact block with LED	BB	230 V
HMI	HMI operator panel	MT4414T	24 V
K1, K2	Electromagnetic relay	G2RV-SL700 DC24	24 V, 4 A
KM1	Contactor	LC1D09M7	400 V, 9 A
KM2	Contactor	LC1D32M7	400 V, 32 A
M1	AC Motor	TN80A2 B5	400 V, 3000 rpm
M2	Stepping motor w/gearbox	FL86STH65-2808G5	2.8 A
M3 — M5	Stepping motor	FL86STH65-2808	2.8 A
M6	Stepping motor	FL57STH	2.8 A
MF	AC centrifugal blower	MB630-D	230 V
QF	3-poles circuit breaker	S203-C32	32A
R1 — R7	Resistor	C2-23-2	2kΩ, 2W
SA1	Emergency stop button	B200E40	4A
SA2	Selector switch stable red	B100SL20K	4A
SB1, SB2	Push button black	B100DH	4A
TV	Power supply	S8VK-C24024	24 V, 10A
UZ	AC motor VFD	VFD007EL21A	230 V
VS1, VS2	Solid state relay	SAL963460	24 V, 45A

Annex B. Safety temperature regulator settings

PARAMETER	VALUE	EXPLANATION
In-t	ECA	Temperature sensor (thermocouple, K type)
L-SU	250	Lower limit of set point
H-SU	400	Upper limit of set point
oUt	rLY	Relay control output
C-nd	onoF	Type of control ON/OFF
AL-1	An1	Alarm mode
AHYS	10	Hysteresis alarm output
AL1	-20	Temperature alarm output
HYS	20	Hysteresis
LoC	LoC3	Settings lock

Set point (SV) is 370°C by default. All parameters above must be set in order as they appear in the list above.

Annex C. VFD settings

PARAMETER	VALUE	EXPLANATION
01.00	70.0	Maximum output frequency, Hz
01.16	4	Auto acceleration/deceleration
02.00	3	Source of First Master Freq command (RS-485)
02.01	4	Source of First Operation command (RS-485, STOP/RESET disabled)
02.07	1	UP/DOWN mode (based on accel/decel time)
02.11	40.00	Keypad frequency command
09.00	5	Communication address (1)
09.04	1	Communication protocol (ASCII 7, E, 1)

Annex D. Testing mode

In testing mode, main machine components may be tested. From the start screen, press SETTINGS, type ‘3333’ password, and confirm with ENTER. Testing screen will appear:

Fig. 7 Testing mode screen

There are buttons and indicators that are responsible for certain components of the machine:

VFD MOTOR RS485	turbine drive
Y0.SA SIFTER	sifter motor
Y1.SA OIL PUMP	oil pump motor
Y2 CORN FEED.L	left corn feeder motor (Butterfly)
Y3 CORN FEED.R	right corn feeder motor (Mushroom)
Y3.SA SALT FEED	salt feeding auger motor
Y4.SN SALT FAN	salt blowing fan
Y0.SN HEATER_0	1st group of heating elements[6]
Y1.SN HEATER_1	2nd group of heating elements
Y5.SN BUZZER	Buzzer
X0 Sensor Chamber	chamber sensor condition
X1 Button SIFTER	SIFTER button condition
X2 Button WARM	OIL WARM switch condition
X3 Sensor Corn Left	left corn hopper sensor condition
X4 Sensor Corn Right	right corn hopper sensor condition
X5 Sensor Bag	cart sensor condition
X6 Heater control	AL1 signal from safety temperature limiter
Probe Type K	type of temperature sensor

In the low part of the screen there are buttons for adjusting turbine speed (VFD), oil and salt supply rates, and also current chamber temperature. Turbine speed and oil/salt supply rates are only valid in testing mode and don’t affect program settings.

[6] Heating elements can be activated only while the turbine is on.

Annex E1. Chamber optical sensor setup

Enter the testing mode of the machine.

ATTENTION! SOME COMPONENTS IN THE COMPARTMENT ARE UNDER HIGH VOLTAGE! BE CAREFUL WHILE OPERATING INSIDE!

Open electric compartment, find the optical amplifier, see Fig.1

Fig. 1 Optical amplifier: 1 – Operation distance adjusting screw; 2 – Operation indicator

Open the chamber and make sure that the sensor head is clean, use a dry soft cloth if necessary.

Put a piece of paper or any suitable item inside the chamber, in order to block sensor's sightline in the middle of the chamber, see Fig.2.

Use the adjustment screw on the amplifier to set the operating distance accordingly. Use the operation indicator on the amplifier to see the moment of tripping, see Fig.1.

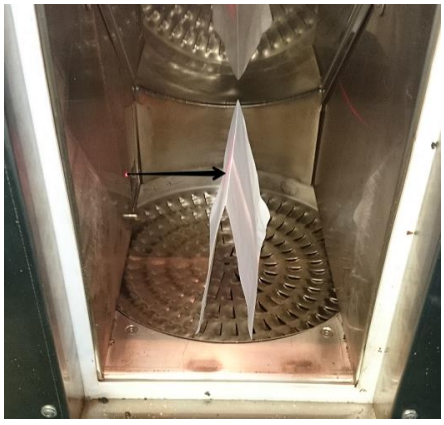
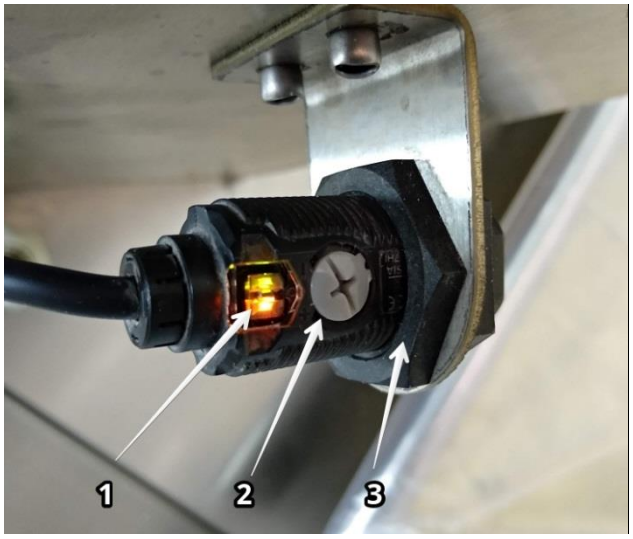
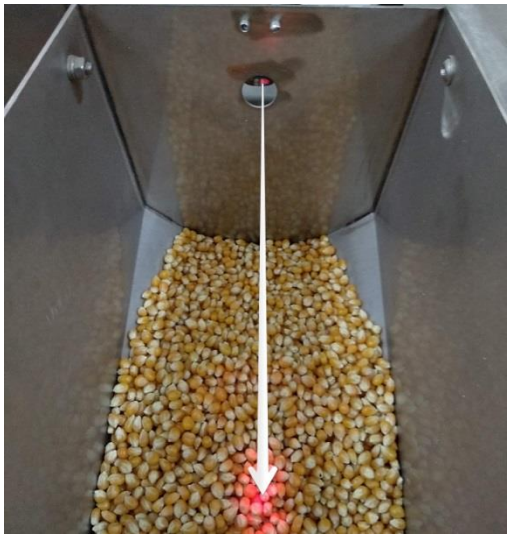


Fig. 2 Paper screen

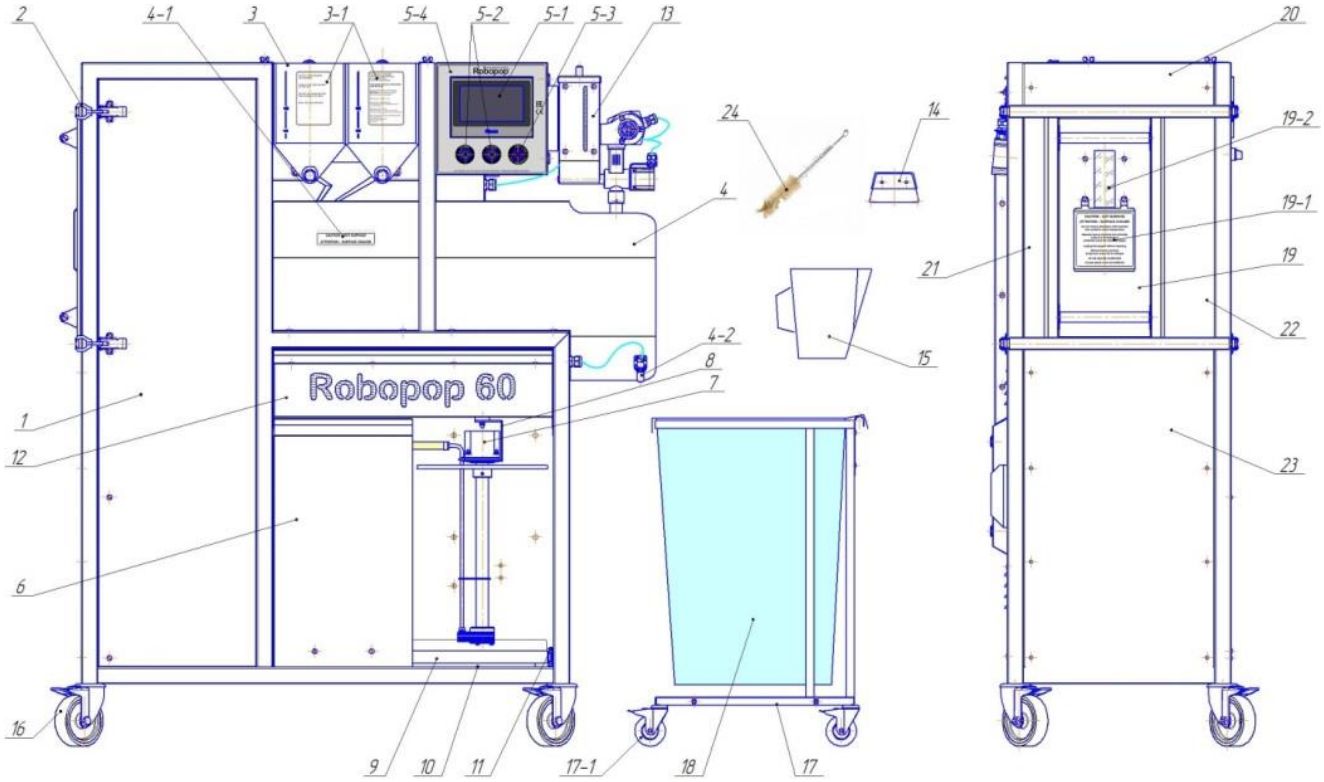
Annex E2. Corn hopper sensor setup

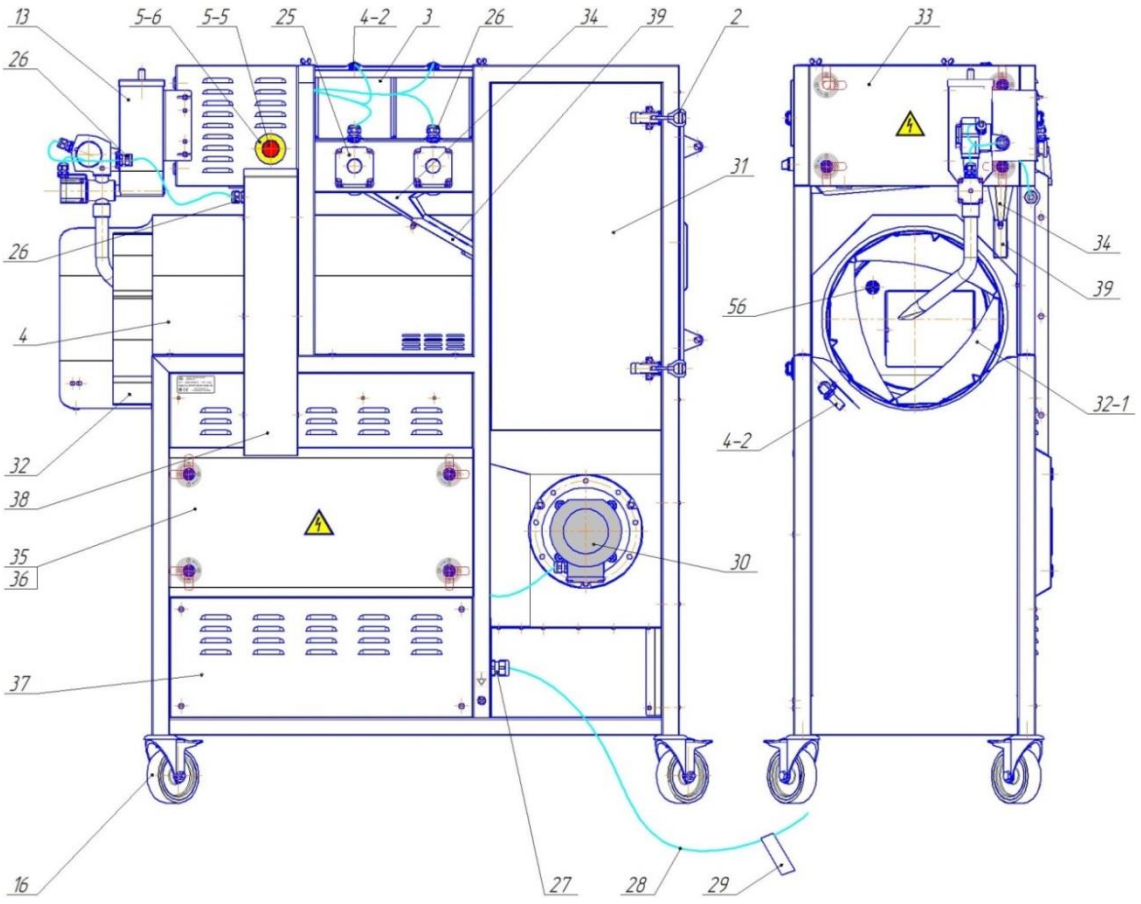


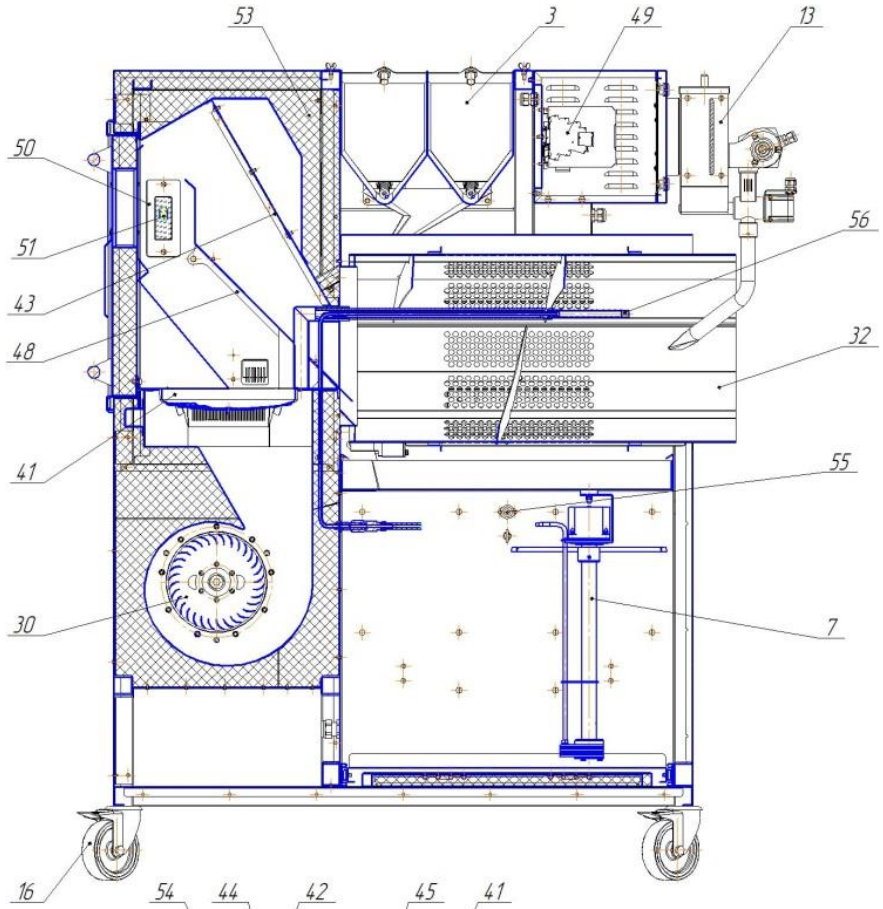


Operating distance of each sensor can be adjusted with adjustment screw 2 (coarse tuning), and locking nut 3 (fine tuning). Use operating indicator to see the current status of the sensor.

Annex F. Parts list



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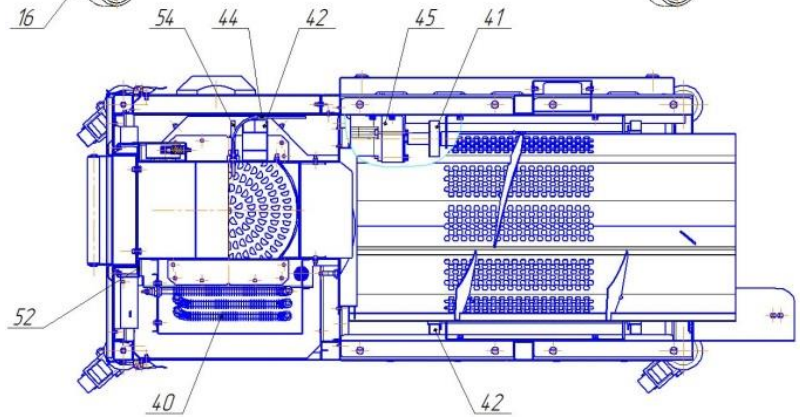
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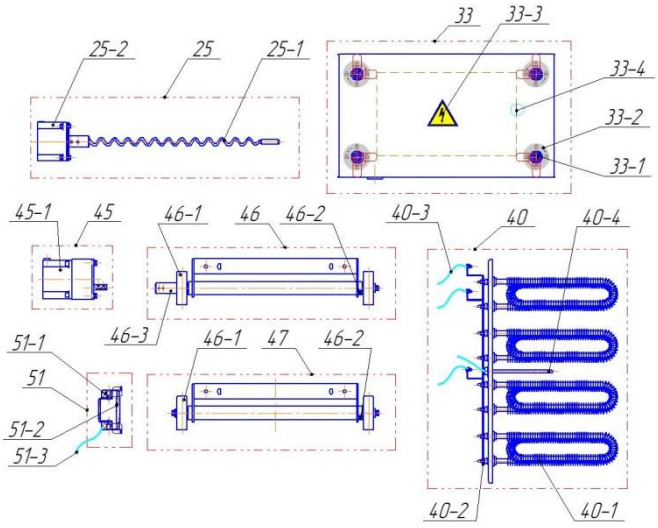
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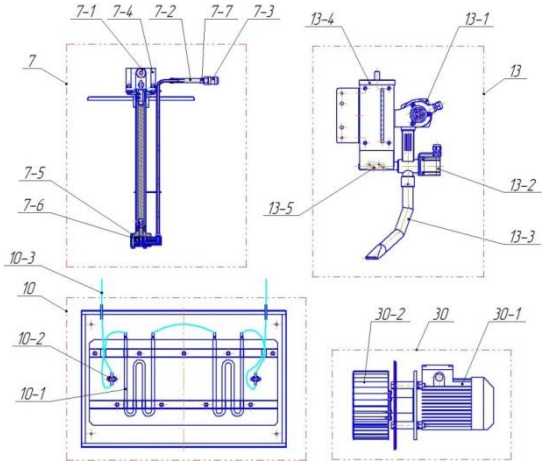
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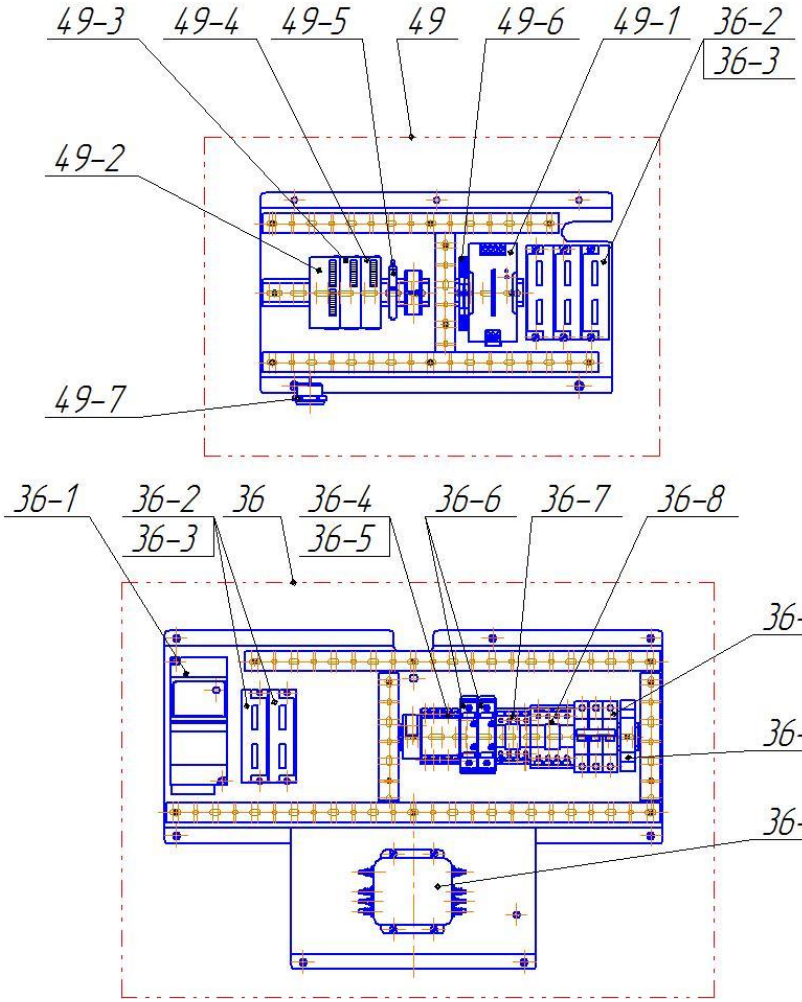

ITEM#	ARTICLE#	PART	MODEL
1	21476	Front panel	TM 2677.00.00.003
2	21477	Lock assembled	TM 2677.09.00.000
3	22034	Corn feeder	TM 2692.02.00.000
3-1	-	Corn feeder sticker (2 pcs)	
4	22035	Sifter protection cover	TM 2692.00.00.004
4-1	-	Sifter protection cover sticker	
4-2	3917	Optical sensor	E3F1-DP12 2M
5-1	2242	HMI panel	MT4414T
5-2	2393	Push button black	B100DH
5-3	16121	2-pos switch	B100SL20K
	16490	Contact block with backlight	BB
	1301	Contact block	B1
5-4	13585	Control panel sticker	
5-5	496	Emergency stop button	B200E40
5-6	4068	“STOP” label	BET60A
6	22036	Oil compartment door	TM 2692.12.00.000
7	20565	Oil pump assembled	TM 1672.01.06.000
7-1	2741	Cable socket (male)	C016 30G006 100 12

ITEM#	ARTICLE#	PART	MODEL
7-2	3718	Oil hose 1.3 m (6 mm inner dia)	
7-3	2740	Quick-release connector	
7-4	13832	Step motor	FL86STH65-2808A
7-5	13683	Pump rotor (outer)	15122-329-010
7-6	13684	Pump rotor (inner)	15123-329-010
7-7	11223	Stepless clamp	
8	20581	Pump bracket	TM 1672.04.00.000
9	20583	Perforated shelf	TM 1672.01.05.000
10	20584	Oil warmer assembled	TM 1672.01.07.000
10-1	3752	M-shaped heating element	1GIK1Z159001
10-2	13007	High limit thermostat	TK24-00-1-90
10-3	20592	Oil warmer wire set	
11	13485	Drawer slides	
12	22037	Scrap tray	TM 2692.01.00.000
13	22038	Salt feeder assembled	TM 2692.10.00.000
13-1	345	Salt blower	MB630-D
13-2	4022	Step motor	FL57STH56-2804A
13-3	20586	Salt dispensing tube	TM 1672.01.10.300
13-4	20587	Salt feeder cover	TM 1672.01.10.100
13-5	22039	Salt auger with clutch	TM 2692.10.02.000
14	20590	Cleaning scraper	TM 1672.03.00.000
15	13669	2 L cup	
16	1215	Lockable swivel caster 125 mm	3300-PUR-125-F18
17	77963	Cart	TR1
17-1	1203	Lockable swivel caster 75 mm	
18	1838	LDPE bags (50 pcs)	
19	21480	Chamber door assembled	TM 2677.08.00.000
19-1	-	Chamber door sticker	
19-2	21481	Double glass	TM 2677.08.02.000
20	21482	Upper panel	TM 2677.08.00.005
21	21483	Left side panel	TM 2677.08.00.006
22	21484	Right side panel	TM 2677.08.00.007
23	21485	Lower side panel	TM 2677.08.00.004
24	20744	Cleaning brush	
25	22040	Corn feeder drive	TM 2692.03.00.000
25-1	21487	Corn auger	TM 2677.03.01.000
25-2	13832	Step motor	FL86STH65-2808A
26	13446	Gland	PG13,5
27	776	Gland	PG21
28	20673	Power cord 4 m	КГН 4x4
29	13592	Power cord label	
30	21488	Motor with impeller assembled	TM 2677.15.00.000

ITEM#	ARTICLE#	PART	MODEL
30-1	17431	AC motor	TN80A2 B5
30-2	21489	Impeller with flange	TM 2677.15.01.000
31	21490	Rear panel	TM 2677.00.00.002
32	22041	Sifter	TM 2692.04.00.000
32-1	21492	Sifter blade	TM 2677.04.02.000
33	21493	Electric compartment door	TM 1672.01.11.001
33-1	806	Door lock	KY05.1.2
33-2	14960	Door lock sticker (4 pcs)	
33-3	-	Bolt sticker	
33-4	-	Wiring diagram sticker	
34	20570	Corn funnel	TM 1672.01.17.000
35	22042	Power compartment door	TM 1672.01.09.000
36	22043	Power compartment	
36-1	12648	Variable frequency drive (0,75kW, 220V)	VFD007EL21A
36-2	13715	Step motor driver	DM556
36-3	2786	Resistor (2 W, 5%, 2.0 k)	C2-23
36-4	16118	Temperature regulator	TC4SP-14R
36-5	22014	11-pin socket	PS-11
36-6	14641	Solid-state relay Celduc (32A, 3,5-32VDC)	SAL963460
36-7	13450	Contactor 9A	LC1D09M7
36-8	13449	Contactor 32A	LC1D32M7
36-9	77	Circuit breaker	S203-C32
36-10	3895	EMI filter	DL-25EB3
37	22044	Lower rear panel	TM 1672.01.00.005
38	22045	Wire channel cover	TM 1672.01.00.013
39	20569	Corn dispensing tube	TM 1672.01.36.000
40	21495	Heater	TM 1672.01.23.000
40-1	3744	Finned heating element 2500 W 230 V	1GIK8BL33001
40-2	21496	Copper bus set	
40-3	21497	Hot-resistant wire set	
40-4	21469	Temperature sensor thermocouple K type	ДТПК 054-00.120/2
41	21498	Bowl	TM 1672.01.26.000
42	21499	Corn supply unit	TM 1672.01.29.000
43	21500	Mesh screen frame	TM 1672.01.30.000
44	12888	Optical sensor head	E32-D61
45	21501	Sifter drive	TM 2677.07.00.000
45-1	4023	Step motor with 1:5 gearbox	FL86STH65-2808A
46	21502	Drive roller assembled	TM 2677.05.00.000
46-1	1224	Wheel	MTB 75x22
46-2	2480	Bearing	6101
46-3	21503	Clutch	TM 2677.05.00.002
47	21504	Idle roller assembled	TM 2677.06.00.000

ITEM#	ARTICLE#	PART	MODEL
48	21505	Chute	TM 2677.13.0.000
49	22047	Control compartment	TM 1672.01.12.000-01
49-1	13451	Power supply unit (240W, 24V)	S8VK-C24024
49-2	13765	PLC	DVP12SA211T
49-3	13766	PLC extension outputs	DVP08SN11T
49-4	20328	Temperature controller	DTC1000V
49-5	12798	Digital optical amplifier	E3X-NA41
49-6	12647	Electromechanical relay	G2RV-SR700 AC/DC24
49-7	11613	Buzzer	SC235B
50	21507	Backlight glass unit assembled	TM 2677.16.00.000
51	21508	Backlight assembled	TM 2677.17.00.000
51-1	2281	Lamp socket	R7s 206
51-2	13454	Halogen lamp 64684 ECO	48W 78mm 230V R7s
51-3	21509	Lamp wire set	
52	2666	Profiled gasket silicone white	№14-12
53	13860	Rockwool 38 mm (1 roll)	1260 (1300) - 128
54	22407	Thermocouple	ДТПК 124-00.32/2,5
55	2741	Socket (female)	C016 30G006 100 12
56	20579	Oil nozzle	TM 1672.01.27.000
	15075	Hot-resistant sealant, gray	Hot-resistant 250°C
	13538	Anti-seize food grade paste (1 kg)	Molykote P-1900 FM
	20573	PLC — VFD interconnection cable	
	20899	Program transfer unit	DVP-PCC01